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ORIGINAL ARTICLE

Colors, brain and immateriality

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The hypothesis we present in this paper is about the representation of colours in the nervous system as metaphysical and immaterial properties of the neural activations, first in the lateral geniculate body and following in the primary visual cortex, where the colours are not directly coded but whose representation is modulated by a signal born by fewer neurons. The metaphysical background of this hypothesis is the dualism of properties that will be discussed in the last paragraph of this article.

Keywords: Colours, Mind, Mind-Brain, Immateriality

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INTRODUCTION

In this article we will introduce a peculiar idea about the relationship between the colours of the visual perceptual field and the electrical activations of the primal cortex V1's neurons, hitherto believed to be underlying it. First, we will make a brief recapitulation of how the signal from the retinas reaches the primary cortex, then we will proceed to express our hypothesis up to its philosophical justification. This latter part will take no more than a few pages, such as needed to express an idea in a coherent and concise manner.

METHODS

In this paper we will display a method to translate the cerebral activity of V1 cortex into a mind representation, applied to colours.

If we take into consideration a three-axis system as the Cartesian axes, to every point in the system we can associate a value that corresponds to a continuous or discrete value between 0 and 1. That represents a single neural activation in V1 cortex and corresponds to the modulate signal that comes from the retina. We can translate it in another three axis system to show the visus so that at every level of neural activation of the first type corresponds a determined point (a,b,c) which is associated to an instantiated property (i.e. "r"); that is the particular colour that appears in the visus at the level of elaboration of a singular cell of the lateral geniculate body (Hubel, 1988).

Regardless of the functioning of the neural sub-stratus, this translation permits us to move from the all-or-nothing single cell events of V1 to the immaterial events of the first perceptive part of the mind-brain. We could even add another dimension with the inclination of the contour that is prerogative of V1, but it is not the point here. The main significance is that by using this method we are able to translate the nervous signal into its immaterial properties. Our purpose with this paper is to provide examples as well as a fruitful visual representation to showcase the procedure we conceived.

WHAT IS A SPOT OF COLOUR IN THE LATERAL GENICULATE BODY

As we have just ascertained, the information that goes from P cells to V1 is retained. What happens to the activation of V1 cells? For simplicity, let's assume that the V1 cells exemplify our visual field (see for example Lamme at al., 2000; for the theme of V1 contribution in visual awareness) and that the colours are intangible properties of the electrical activation of the cells in V1 (How and why this is possible and convenient will be explained in the last paragraph). It is therefore possible to associate with each retinotopic activation of the cells in the lateral geniculate body of the thalamus, and consequently in V1, a spot colour appearance in our visual field. The same goes for

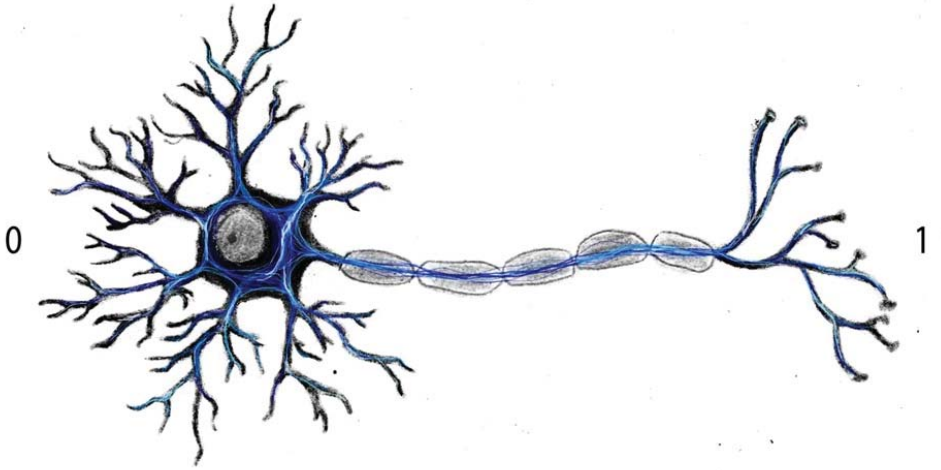
V1: at every activation of singular cells we can link a complex representation of characters of the visus in V1.

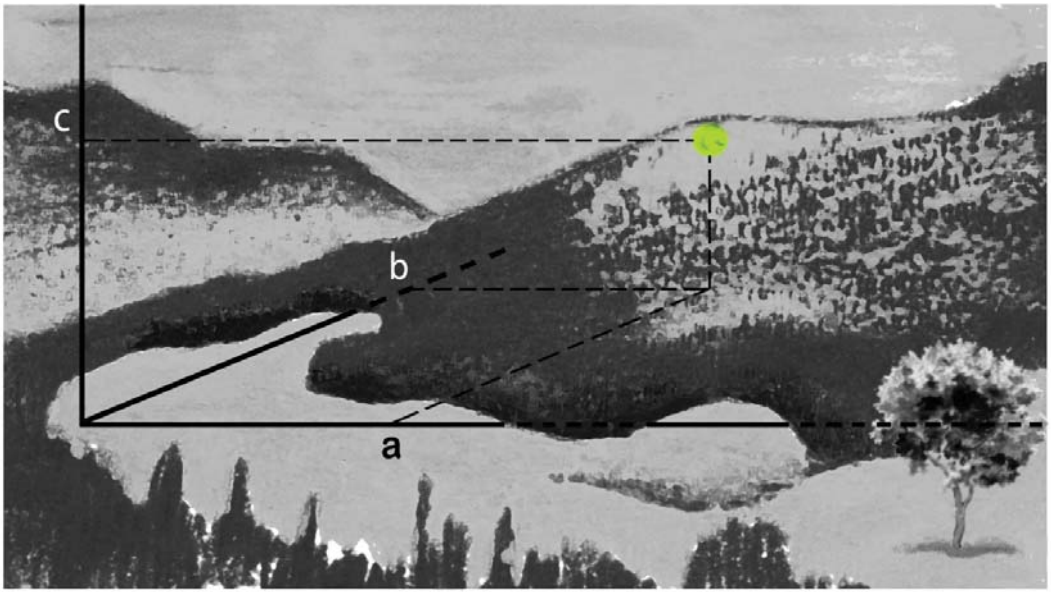
If we grant, hypothetically, that the information about colours is represented in geniculate lateral body's step of elaboration (see, for an overview on perception of colours, Gouras, 1991 and Kaiser & Boynton, 1996), each cell can be identified in our three axis system form a point with coordinates A,B,C and an activation between 0 and 1 whether it is continuous or discrete. This way, for any given electrical activation of a A-value between 0 and 1, a given spot of colour corresponds to our spectrum in visual coordinates of the "red", "yellow" or "green" type, for example, and will have the respective coordinates to the retinotopic ones of the type A,B,C, in our field of vision at the geniculate lateral body's level.

This is a way to link the immateriality of colours, that seem to have no causal powers and therefore have to be expelled from the realm of physical and material things, to the physical aspects of the neural activations of the visual cortex and electrical activations, which is their most important feature. All of this starting from a homogeneous basic activation and a total correspondence between retinotopy and "coloured" visual field.

This can be exemplified by means of two images.

The first image roughly represents the activation of a singular cell, while the second shows the result of the activation in the visual field at the lateral geniculate body's level of representation. Naturally, there are steps of elaboration and synchronic activation that we cannot consider to have the location of the final spot in a three-dimensional manner, since once the stream of information has reached the V1





cortex, a singular activation can represents a large part of the visual field and not necessarily a single spot of colour.

According to our hypothesis, the fact that cells are never completely silent is reflected in the fact that the visual field is a metaphysically unitary field, in which the colour spots change as the excitation of the cells of the retina and the quality of the incoming light vary.

In the next paragraph, we will talk about the philosophical background of the ideas displayed until now.

A KIND OF PROPERTY DUALISM

The Stanford Encyclopedia of Philosophy (2020) thus defines the property dualism:

> "Whereas predicate dualism says that there are two essentially different kinds of *predicates* in our *language*, property dualism says that there are two essentially different kinds of *property* out in the world. Property dualism can be seen as a step stronger than predicate dualism. Although the predicate 'hurricane' is not equivalent to any single description using the language of physics, we believe that each individual hurricane is *nothing* but a collection of physical atoms behaving in a certain way: one need have no more than the physical atoms, with their normal physical properties, following normal physical laws, for there to be a hurricane. One might say that we need more than the *language* of physics to describe and explain the weather, but we do not need more than its *ontology*. There is *token* identity between each individual hurricane and a mass of atoms, even if there is no *type identity* between hurricanes as kinds and some particular structure of atoms as a kind. Genuine property dualism occurs when, even at the individual level, the ontology of physics is not sufficient to constitute what is there. The irreducible language is not just another way of describing what there is, it requires that there be something more there than was allowed for in the initial ontology. Until the early part of the twentieth century, it was common to think that biological phenomena ('life') required property dualism (an irreducible 'vital force'), but nowadays the special physical sciences other than psychology are generally thought to involve only predicate dualism. In the case of mind, property dualism is defended by those who argue that the qualitative nature of consciousness is not merely another way of categorizing states of the brain or of behaviour, but a genuinely emergent phenomenon"

The dualism of properties is the philosophical position that best describes the relationship shown between the electrical phenomenon of neural origin and its phenomenal counterpart, the spot of colour which is, in our case, simply immaterial (see also Lavazza & Robinson, 2014). The fact that a physical phenomenon, such as the electrical impulse of a neural nature, have a property like a colour that does not interact with the objects of the world outside ourselves, is, in our opinion, a fundamental property of our perception. It means there is the possibility to belong to an immaterial realm, in which on one hand the laws of physics remain unchanged and causally closed (for a historical version of the problem see Davidson, 1980), while our perceptions, taken for themselves, can guide our being in the world.

The immaterial structure of the perceived, composed into a unitary perception, can in fact guide us through retinal stimulation, neural electrical activations and their causal relationships without being there a real change in the natural order of things. The ability of metaphysical properties to guide physical activations will only be limited by the laws that regulate the realm of physical things.

This dualism of properties isn't just more suitable in this case, but also desirable (see, for example, Yang, 2015): if the immaterial intangible properties were independent, so to speak, they would have no causal powers and would be irrelevant. If, on the other hand, they were physical, we would have to increase the ontology of brain phenomena indefinitely and in a highly unrealistic way to the state of our knowledge. In this connotation, we should see colours, shapes etc. jump out of the skull.

In a broader sense, if the possibility of change of the "objective experience" is due to the immaterial part of corresponding neural activation, then the phenomenon of intentionality towards - and the subjective experience of - "something different" are not a problem anymore. The mental, immaterial part of neural activity that is considered the fixed condition of the "constant change" of our experience is exactly the environment in which we see, smell, etc., and in which we act intentionally as immaterial agent with cognitive and causal powers (for further discussion of this issue, see i.e. Searle, 1983).

That the objects outside our immaterial experience can interact with the physical body is not surprising anymore. It is clear that when we encounter an object in our experience, we

encounter its counterpart in the extra-mental experience, mainly in the tactile experience. However, the limitation of this position is the limitation of the position itself. There are many philosophical theories about the mind nowadays, and they swing between the hard reductionism and the pure dualism. This version is a form of dualism, as we have seen, but the proof of the theory over every kind of argumentation, if any, should be an empirical one.

What is surprising is that the immaterial reality can drive ourselves, our physical body, in the world outside our experience. The answer is probably in the computational power and plasticity of our brain, and in the role the immaterial part of our neural activity plays into guide our brain in its development.

CONCLUSIONS

In the second paragraph, after the method section, we portrayed how the neural activity that starts from the retina reaches the nerve fibers of the primary visual cortex. The characteristics of the signal and all the necessary steps of retransmission of the neural signal were summarily displayed to show how a spot of colour could appear in a given portion of the visual field due to the activation of the geniculate lateral corps, at the stage of elaboration of V1 cortex, even if not yet in the three-dimensional visual field.

In the third paragraph, the fundamental idea for this article was introduced. The colour spot that corresponds to neural electrical activation was considered to be the immaterial property of the same electrical phenomenon of neural origin, and a real correlation was established between the electrical impulse of a neuron and the appearance in the visual field of a coloured spot. The representation of these events postulated that the representation of the entire visual field was already in V1 by means of the synchronic activation of the geniculate lateral body's cells. This is not literally true, but served as a mean to enhance the explanation of our hypothesis: that the colour spot that corresponds to the perceived signal is an intangible property of the electrical phenomenon of neural origin.

Ultimately, in the last paragraph we showed how a philosophical position such as the dualism of properties is the best one to account for the immaterial phenomenon taken into consideration. It allows us to explain both why the colours do not leap out of the head as objects as well as why the laws of physics and the causal closure of the universe are not questioned by the organized and driving appearance of these phenomena. Moreover, it was seen how, on this account, intentionality and subjectivity can be explained.

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REFERENCES

Davidson D. (1980) Essays on actions and events. Clarendon Press, Oxford.

Gouras P. (1991) (Ed.) The Perception of Colour. CRC Press, Boca Raton, FL.

Hubel DH. (1988) Eye, brain and vision. Scientific American Library, New York.

Kaiser PK, Boynton RM. (1996) Human color vision, 2nd ed. Optical Society of America, Washington, DC.

Kandel R, Schwartz H, Jessell M. (2013) Principles of neural science, Fifth Edition. McGraw-Hill, New York.

Lamme VAF, Super H, Landman R, Roelfsema PR, Spekreijse H. (2000). The Role of primary visual cortex (V1) in visual awareness. Vision Research, 40:1507-1521.

Lavazza A, Robinson H. (2014) Contemporary dualism: A defense. Routledge, London.

Searle J. (1983) Intentionality. Cambridge University Press, Cambridge.

Stanford Encyclopedia of Philosophy (2020). Dualism. Retrieved 03 Nov. 2020 at: https://plato.stanford.edu/entries/dualism/

Yang E. (2015) The compatibility of property dualism and substance materialism Philosophical Studies, 172:3211-3219.

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